MODES OF DYING,
ETC.

HARVEIAN SOCIETY'S ADDRESS,

1870.

W. F. CLEVELAND, M.D.

7/-

Ccl.66

R32430

THE

MODES OF DYING,

AND THE

MEANS OF OBVIATING THE TENDENCY TO DEATH.

THE

ANNUAL ADDRESS,

DELIVERED BEFORE THE HARVEIAN SOCIETY OF LONDON,
October 20, 1870.

BIBLIOT

BY

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PRESIDENT.

LONDON:
JOHN CHURCHILL & SONS, NEW BURLINGTON STREET.
1870.

THE MODES OF DYING.

GENTLEMEN,

Interesting as have been the addresses delivered during the last year before Societies like our own (I allude to the Medical and Hunterian Societies of London), it is not my intention on this occasion to reproduce any of those *curious* Harveian records, the first deposit of which took place in our archives about forty years ago.

No, with your permission, I will follow a course that has not unfrequently been adopted, viz., that of endeavouring to engage your attention while I offer a few remarks on a topic that may be thought worthy of your consideration : The modes of dying and the means of obviating the tendency to death.

This is a subject on which much has been written, and much, I believe, remains to be investigated ; and to us, who are actively engaged in waging war against the great adversary of our bodies, it surely must be a matter of interest to ascertain, as far as we can, how he ultimately wins the victory—perhaps after a long but bravely resisted siege—or how he suddenly storms the fortress, and, disregarding every flag of truce, puts the whole garrison, heart, lungs, and brain, in a few moments *hors de combat.*

It has not, however, entered into my mind to attempt anything further this evening than probably to recall to the recollection of my hearers those cardinal points of the question which, as students they have been taught, or, as practitioners of experience, they have observed for themselves; and I must crave your indulgence if I have failed to do little more than write off in a discursive manner such thoughts as have occurred to me from time to time.

When the great Jewish Law-giver affirmed, some four thousand years ago, that *the life of the flesh was in the blood,* he struck a deep physiological, and conversely pathological, note whose vibration has been only made clearer by the latest researches of modern times; for who can doubt, after due inquiry, that however enveloped in mystery is the starting point of life, there is in reality but one final cause of death, or, in other words, that *the death of the flesh takes place through the blood?*

It is customary to speak of death beginning at the heart, the lungs, and the brain; but, strictly speaking, life only ceases, either from the quantity of blood in the system being defective; or from the heart losing its power to propel the blood, as in syncope; or when non-arterialised or carbonised blood is first circulated in the arteries, and ultimately stagnated in the pulmonary capillaries, as in suffocation; asphyxia or apnœa, as it is called.

As valid objections have been raised to both these technical terms, I would venture to propose, although fully alive to the danger of coining a new word, and especially a hybrid, and still feeling the want of a less objectionable word, that the term *Carbonœmia* should be adopted as more expressive of, or more of a practical key than asphyxia or apnœa to, that kind of death which is brought about through venous blood in the lungs ceasing to undergo the chemical change of parting with its carbon in the form of carbonic acid, and absorbing oxygen instead, whereby it is rendered capable of sustaining the various functions of animal life.

Before considering in detail the different modes of dying, let me remind you that the subject had not failed to engage the attention of our great dramatist, who makes King Henry say to Warwick, on his reporting to him the death of Duke Humphrey,

> "That he is dead, good Warwick, 'tis too true!
> But how he died, God knows, not Henry;
> Enter his chamber, view his breathless corpse,
> And comment then upon his sudden death."

Then, in an inner chamber, while looking on the body, Warwick says:—

> "I do believe that violent hands were laid
> Upon the life of this thrice-famed duke."

Suffolk, one of the King's party, inquires—

> "What instance gives Lord Warwick for his vow?"

When he replies—

> "See how the blood is settled in his face!
> Oft have I seen a timely parted ghost,
> Of ashy semblance, meagre, pale, and bloodless,
> Being all descended to the labouring heart;
> Who, in the conflict that it holds with death,
> Attracts the same for aidance 'gainst the enemy;
> Which with the heart there cools, and ne'er returneth
> To blush and beautify the cheek again.
> But, see, his face is black, and full of blood;
> His eye-balls farther out than when he liv'd,
> Staring full ghastly like a strangled man,
> His hair uprear'd, his nostrils stretch'd with struggling,
> His hands abroad display'd, as one that grasp'd
> And tugg'd for life, and was by strength subdu'd,
> Look on the sheets, his hair, you see, is sticking;
> His well proportioned beard made rough and rugged,
> Like to the summer's corn by tempest lodg'd.
> It cannot be, but he was murder'd here;
> The least of all these signs were probable."
>
> *King Henry VI*, Act iii, Scene 2.

Death by Anæmia.

When an animal is bled to death, or a man dies from a wound of a large artery, as too many thousands have of late on the battle-field, or a woman floods to death in child-bed, we have examples of the simplest form of death, viz., that which is ordinarily called death by syncope, and which has been designated, for the want of a more precise term, death by Anæmia, (privation of blood) understood, of course, in a comparative sense. Here the heart ceases to beat, not because it has lost its contractile power, but mainly because there is not a sufficient quantity of blood in the system to keep it in action as a hydraulic machine. That this is the true explanation of sudden death from loss of blood has never been disputed, and I need scarcely remind you that it rests on the facts that resuscitation may be, and often has been, effected by timely transfusion, and that, in bodies after death by anæmia, the heart's cavities are found empty.

No one who has seen a person die by this mode can easily forget the pallor, the ghastly look, the staring eyes, and the cold sweat on the brow; and, as death has approached, he has perhaps observed vomiting, hurried, irregular breathing, and as a rule, more or less of convulsion.

Death by Asthenia.

This, then, the first mode of death by syncope (the word meaning a suspension of the heart's action), may be considered as almost mechanical; but there is another mode of dying at the heart, in which the cause of the phenomena is the converse of what we have been considering. This second mode of death by syncope has been called death by Asthenia, the term denoting, as you are aware, a failure of strength or paralysis of the central organ of the circulation. It embraces a far wider field of inquiry than the first.

In its acute or sudden form we may view it under three aspects.

Cessation of action produced by—

1. Nervous shock, such as intense mental emotion, a blow on the epigastrium, violent concussion of the brain, extensive burns, some forms of *coup de soleil*, lightning, or electricity, etc.

2. The effects of some of the poisons, such as nicotine, hydrocyanic acid, chloroform, and, according to Alison, full doses of antimony, oxalic acid, arsenic, digitalis, etc.

3. Degeneration of cardiac structure, in some cases amounting to disorganisation of muscular tissue, obstruction from fibrinous concretion, adherent pericardium, ossification, etc.

Death by Asthenia.

Here there is no deficiency of blood, but the heart stops, in the great majority of cases, from loss of contractile power (paralysis), or perhaps, in rare cases, from a spasmodic closure of its cavities, but under either circumstance the effect is the same, viz., the arrest of the circulation; although if it should be proved that death at the heart is sometimes produced by tonic contraction, thereby closing the cavities of the organ to the admission and transmission of the blood, the term asthenia, of course, in such instances would be open to objection.

Under the third variety, especially, of this mode of death, which includes cases of angina pectoris, syncopal asphyxia, etc., Dr. Richardson has proposed the term cardiac apnœa, as a key to the phenomena attending the act of dissolution. He considers that it is as improper to speak of death by asthenia as death by coma, they being only the forerunners respectively of death at the heart (syncope) and death at the lungs (cardiac apnœa). He says, "if the circulation and respiration are not interrupted there can be no death. As a man may be comatose for weeks, and not of necessity die until such time as his respiration and circulation fail, so he would say there may be asthenia for a shorter or longer time until death is brought about by cardiac apnœa."

Death by Asthenia.

But let us see what is implied by the term. It is then, according to Dr. Richardson, essentially, when fatal, a form of death arising from failure of the right heart to send blood into the lungs, so that the blood suffers the want of oxygenation as much in effect as if it *were* sent into the lungs, and there was no air in them to oxygenate it; or, in the author's own words, there is no difference in effect between cutting off the blood from the air and cutting off the air from the blood; or, further, that cardiac apnœa, when fatal, virtually kills like any other form of apnœa.

I agree with Dr. Richardson, that the effect in the long run would be the same on the blood by shutting it off from air as shutting off air from it; but the question is, do the phenomena of dying by sudden failure of the right heart correspond with those of dying by the ordinary forms of asphyxia or carbonæmia? Does the current of blood, arrested at the right ventricle and pulmonary artery, lead to the same kind of death as when it is arrested in the lungs from the privation of air? In the so-called cardiac apnœa there may be suspended respiration because little or no venous blood is sent into the lungs, but there is marked pallor of the countenance instead of blueness and congestion of the lips and

Death by Asthenia.

cheeks as in suffocation, and there are clearness of mind and acute liveliness to all impressions, if the act of dying be protracted, in lieu of vertigo, confusion, and delirium.

Time will not allow me to discuss this matter at length, but to my mind the explanation is satisfactory that death at the right heart arises from failure of the organ to propel the blood through the lungs, and as a consequence the blood column is broken; there is a failure of supply to the left auricle and ventricle, and, as a further consequence, the current to the brain is suspended; and then a condition is produced analogous to that effected by Sir A. Cooper's experiment of tying both vertebrals and carotids, when only a few convulsive contractions take place, and the animal ceases to exist.

I would submit, therefore, that the phenomena attending this form of dissolution indicate death at the heart rather than at the lungs, and may be accounted for more rationally by ascribing them to syncope than to carbonæmia, by which latter term is implied a deprivation of the chemical influence of the air upon the blood.

I have before remarked that, although asthenic death is generally associated with cardiac paralysis,

Death by Asthenia.

occasionally we meet with sudden death in which there would seem to be evidence of muscular spasm, as shown by tonic contraction of the heart's walls.

The following case illustrates this point:—

In April, 1861, I was summoned to Mrs. G., aged 76, very stout, who had suffered of late from shortness of breath and pain in the back. After taking a very light breakfast she walked a mile and a-half, and had only just seated herself in a chair when she turned extremely pale and died almost instantaneously. On inspection there was found a thick layer of fat over the heart, which was large, its walls being thick, its valves healthy. There was a very small quantity of fluid blood in the right auricle; *but the right ventricle and the left side of the heart were firmly contracted and absolutely empty.*

I could bring forward several cases in which the appearances after death would warrant the inference that the heart's action had failed from want of contractile power, as evidenced by the distended right auricle and ventricle; but I will mention only one, and that chiefly because it has some bearing on a point that was considered by some of the older writers of much importance. I allude to the condition of the coronary arteries.

Death by Asthenia.

In the spring of 1855 I was called to a man who had fallen down dead in the street. He was a gentleman's coachman, aged 37, of sober habits; he had suffered about a year from pains in the head and chest. He was sent on a hasty errand, and in the act of running was seen to fall, and in a few moments he expired. On examination the right side of the heart was found greatly distended with blood, while the left was comparatively empty. The right auricle was much atrophied, valves healthy, aorta somewhat dilated and atheromatous, orifice of left coronary artery contracted and puckered by deposit, while that of the right could not be seen at all. It was, however, subsequently traced, but its calibre was so narrowed at its origin that a small eye-probe was with difficulty made to pass through it into the aorta.

In this case we can scarcely help thinking that the structural change and weakness of the heart must have greatly depended on the lesion of its circulatory system; although it must be confessed that in many cases of the so-called angina pectoris no disease whatever of the coronary arteries has been discovered.

The external phenomena of dying by asthenia in its acute form do not differ materially from those

Death by Asthenia.

attending death by acute anæmia, but allowance must be made for the circulation being brought to a stand, perhaps more rapidly, as we are accustomed to see it, in the former than in the latter death. In asthenia, then, we have pallor, coldness of the surface, distressed countenance, and perhaps rigidity of the general muscular system as distinguished from the convulsion in death by loss of blood, but this rigidity is modified by the rapidity with which death takes place.

As might be naturally expected when disease leads by a more gradual process to death by asthenia, as in peritonitis, or cholera, or some forms of typhoid fever, we have evidence of extreme muscular debility, the heart's beats are very frequent and feeble, but the sensorial functions remain as a rule unimpaired.

Having, then, glanced at that form of death which is brought about through the heart ceasing to beat, firstly, from the direct loss of its natural stimulus, the blood; and, secondly, through its losing the power to send on that stimulus through its natural channels to the different organs of the body, and especially the great nervous centres, we must now consider the modes in which death occurs mainly through a defect in the quality of the blood; in

Death by Carbonæmia.

other words, through venous, instead of arterial, blood circulating for a time in the arteries, and ultimately stagnating in the lungs; death by Carbonæmia.

Bichat, whose researches on life and death will well repay attentive perusal, divided death of this kind into that beginning respectively at the lungs and head; but, as we found that death at the heart might be viewed, so to speak, under a mechanical and physiological aspect, so we find that death at the lungs, which essentially includes, or ultimately embraces, this kind of death at the head, and which, formerly known as asphyxia, and lately termed apnœa (suffocation), and which I now propose to call carbonæmia, may be considered as occurring *mechanically* when air is shut out from the lungs, as in smothering, drowning, inhalation of certain gases, laryngeal obstruction, etc.; and *physiologically* when the muscles that move the chest for the purpose of respiration are paralysed, as in coma. But the chemical effect, as far as the blood is concerned, and the steps by which life is extinguished, are identical in both cases.

Why, then, do we die when air is excluded from the lungs, or how does carbonæmia kill?

I must almost apologise for reminding you that

Death by Carbonæmia.

during natural respiration the venous blood in the capillaries of the lungs parts with carbonic acid and absorbs oxygen. But this is, in reality, the key to the whole story :—In death by carbonæmia chemical alteration of the blood ceases, and, as a consequence, the fluid is impeded, and *ultimately stagnated* in its passage through the lungs to the left side of the heart. The main cause of this impediment in the lungs appears to be, according to the experiments performed by Sir James Kay Shuttleworth, the check given to the diffusion of carbonic acid out of the air cells; the blood charged with this gas cannot pass readily through the pulmonary capillaries. But, in addition, the blood which does creep lazily on for a time to the left side of the heart is unable to sustain the functions of the organs to which it is distributed, and, as Dr. Carpenter says, "the circulation is gradually enfeebled, the functions of the nervous system are suspended for want of their proper stimulus, and the movements of the heart diminished; the right side gets over-distended and paralysed, the left gets paralysed from want of blood excitement."

Now it is evident that death must soon take place by the increasing tendency to arrest of the blood in the pulmonary capillaries, unless a *vis a tergo* can be found; but that force cannot be obtained from the right ventricle, it can only come from the re-admission of air into the lungs, in other words, through artificial respiration; and then, by the renewed conversion of stagnating venous into flowing arterial blood, or by the checking of that tendency to coalescence of the blood corpuscles which is greatly favoured by diminished motion, and by the re-established movements of the whole pneumatic apparatus, the black and sluggish current is made to assume the healthy arterial hue, and at the same time that thinner consistence by which it is again enabled to pass onwards to the left heart, whose walls are once more stimulated to healthy contraction; when, as a consequence, general circulation and nutrition are restored.

Death by Carbonæmia.

So much for the mechanical exclusion of air from the lungs. Now let us see how death is brought about by coma, or the deprivation of air arising from a failing physiological process. "Coma," according to the definition of Dr. George Burrows, "consists in a suspension of the functions of the brain, while those of the spinal cord remain more or less intact."

But we must ask another question,—what relation does the brain bear to the heart and lungs? Although death does not take place unless the respiration and

Death by Coma.

circulation fail, we cannot but agree with Bichat, who says, "there is a bond between the brain on the part of animal life and the lungs and heart on the part of organic life, and the action of one of these three organs is essentially necessary to that of the two others."

Now as to the influence of the brain upon the heart, although we have seen that shock may suddenly arrest its play, still as regards its ordinary movements we may consider that it is independent of the brain, as is proved in the experiment of carrying on the circulation after the removal of both brain and spinal cord in animals. We may therefore conclude that in death by coma life is not extinguished by the *direct action* of the suspended function of the brain upon the heart.

But how does the brain influence the lungs? Experiments have shewn that, although the pneumogastric nerves may exercise an influence on the nutrition of the lungs, and act as the chief excitors of the respiratory movements in a natural state, still the withdrawal of such influence does not appear to be *immediately* followed by death. Both pneumogastrics have been divided in animals, and yet they have lived many hours afterwards. The same remark is pretty nearly applicable to the influence of the ganglionic system upon respiration.

Death by Coma.

It follows, then, that when coma proceeds to such a point that the brain dies, the lungs do not cease their function from loss of direct influence, but they become seriously affected, as we shall see, in an indirect manner.

We will leave out of consideration for the present the voluntary muscular movements by which respiration is regulated or assisted, and glance at those that are quite independent of the will.

We must then bear in mind that the respiratory action is a reflex motion, and that its nervous centre or head-quarters is the upper part of the medulla oblongata; that the venous blood, while passing through the pulmonary capillaries, probably impresses on the pneumogastric filaments its need of fresh air. The message is telegraphed to the medulla, whence the principal motor nerves of respiration,—such as the spinal accessory, distributed to the trapezius muscle, and the phrenic or internal respiratory of Sir Charles Bell supplying the diaphragm, and the posterior or long thoracic or external respiratory of Bell, arising from the fifth and sixth cervical nerves, and distributed to the serratus magnus,—convey the necessary force for keeping the pneumatic apparatus in action.

Death by Coma.

We may therefore take it for granted that the respiration, as Watson says, hangs directly upon the nervous system, and we have, further, no difficulty in understanding that, in certain states of the brain, such as apoplexy, hydrocephalus, compression from accident, etc., although stupor more or less profound is produced, "although the sensibility to outward impressions is destroyed, sometimes wholly and at once, much oftener gradually; and although all voluntary attention to the act of breathing is lost, and the respiration has become slow, irregular and stertorous, still the instinctive or automatic motions, such as we have just adverted to, continue for a shorter or longer time." But at length the nervous battery, the medulla oblongata, owing to the impure venous blood with which it is fed, gets more and more feebly charged; the afferent messages from the lungs, and the efferent replies to the respiratory muscles become more and more indistinct, and as a result, the chest movements become fewer and farther between; the blood ceases to be aerated, and organic or chemical death at the lungs follows, precisely as in mechanical asphyxia or carbonæmia; only in the case of coma the circulation of carbonized blood is caused by the extinction of animal life, whereas in carbonæmia it leads to the extinction of the same.

The external phenomena of dying by carbonæmia, in its acute form, comprising generally the violent contractions of the muscles of respiration, the insensibility and convulsions, and at last the paralysis of the sphincters, need not be dwelt on; but it should be borne in mind that there are many varieties of this kind of death, and that the symptoms and progress of the process of dissolution differ materially.

It should also be remembered that, as the mechanical exclusion of air from the lungs and the cessation of the respiratory movements from coma, terminate organic life in the same way, so the appearances after death are in the aggregate the same. A word or two will suffice for their description; right side of heart and venous system, generally, as well as lungs, gorged with black blood; left side of heart containing a small quantity of blood of same character. The changes in the nervous system essential for arresting the respiratory action are not at present traceable after death. When death takes place by gradual or chronic carbonæmia, there is time for the lungs themselves, owing to the retarded circulation through them, to become œdematous, the serous infiltration of course only increasing the tendency to suffocation.

Death occurring from sudden carbonæmia, in the course of disease, is not common; but death from chronic carbonæmia is the most common of all deaths. Bichat says, "Whatever be the seat of the principal affection, be it either an organic lesion or a general disorder of the system, the action of the lungs in the latter moments of existence becomes embarrassed, the respiration difficult, and the oxydation of the blood but slowly effected; accordingly this fluid must pass into the arteries almost in the venous state."

And here it may not be out of place to remark that the reason why we almost always find in *post mortem* examinations dark or black blood in the arteries, is—1. Because the greater number of deaths begin at the lungs; and 2, Those that begin at the brain and cause death through the lungs, produce the same phenomena.

Although we meet with typical modes of dying, it must not be supposed that they are not, even frequently, mixed together. Thus, for instance, in apoplexy, death does not always take place through pure coma, but there may be such a shock produced as to primarily influence the heart and cause death by asthenia or asthenia and coma conjoined. So in certain lingering diseases as phthisis and diabetes, in any chronic wasting disorder, or in death by starvation, the gradual mode of dying seems to lie between anæmia and asthenia. In the late notorious baby-farm, the little victims may be said to have succumbed to the triple action of anæmia, asthenia, and coma.

But we must pass on to consider, very briefly, the means of obviating the tendency to death.

In death by acute anæmia it is superfluous to say how necessary it is, first, to stop hæmorrhage, then to remember the importance of the principle of pressure in sustaining the functions of the brain, and therefore to aid the failing heart in its endeavour to propel, with the least difficulty, the diminished amount of blood towards that organ. Hence the value of placing the head on a level with, or even lower than, the trunk of the body. Then stimulants, given however with caution, must be sometimes freely resorted to, such as brandy and beef tea, or wine, ether, or ammonia; opium, also, from its power of sustaining the nervous and vascular systems, is often highly beneficial; warmth in the form of hot bottles to the feet, etc., should not be neglected.

Enemata, containing beef-tea, brandy and ammonia, I have seen of service where there has been irritability of the stomach. Lastly, we have a resource in transfusion, which may be practised with pure blood or a saline solution, but to those who are desirous of obtaining the most recent information on this point I would recommend the perusal of Dr. Barnes's work on obstetric operations.

In considering the means of averting the tendency to sudden death by asthenia, it must be remembered that it may arise from many causes, but that we generally have to deal with an embarrassment leading to paralysis of the heart, especially of its right side; that the circulation through the heart is diminished in force, and that, as a consequence, there is a tendency to coalescence amongst the particles of fibrin, and a risk of concretions or embolia forming. The position of the patient, threatened with this mode of dying, should be semi-recumbent, and air should be freely admitted to him; warmth should be applied to the surface, and brandy and ether, in hot water, to whip the flagging heart, should be administered. Sinapisms over the region of the heart will be found serviceable.

We should also remember the force of Dr. Alison's remark, that two of the most active stimulating remedies, producing their effect through the nervous system, are the affusion of cold water on the face and neck, and the application of stimuli to the nostrils. These seem to specially excite the act of respiration, and thereby determine to the left heart a larger quantity of its appropriate stimulus —arterial blood.

In the more chronic forms of the tendency to death by asthenia the general mode of living should be carefully studied; and especially habits of intemperance with all its attendant evils should be reformed. So, again, diet (notably in reference to sugar) that leads to the deposition of fat, should be inquired into; beer should be exchanged for some light wine, and nitrogenous articles of food recommended; exercise on foot should not be neglected, but it should always be within the limits of fatigue. As regards medicines, iron, either with or without quinine and strychnia, combined with occasional alteratives, may be given with advantage.

Where we have reason to suspect that fibrine is being deposited, the free administration of alkalies, with the view of retaining fibrine in solution, must be resorted to; but the production of dyscrasia, by maintaining super-alkalinity of the blood, must, on the other hand, be avoided. In all cases where there is a tendency to this mode of death, the hygiene must be systematically regulated, and all exciting causes of an acute attack, such as running to a railway station, in order to be in time for a train, which I have known to prove fatal; putting oneself in a position in which violent passion may be aroused, as in the case of John Hunter; inordinate indulgence, or I might have said anything beyond moderate use, of the sexual appetite, should be studiously guarded against.

It is obvious that in inquiring into the means of averting the tendency to sudden death by carbonæmia, we must make it our first object to discover the cause of the suffocation. Thus, although a man dies from asphyxia, if a morsel of meat goes the wrong way and plugs up his glottis, it is absurd to attempt artificial respiration while the entrance of air to the lungs remains mechanically closed; and the same reasoning applies to obstructions about the larynx from disease. But, assuming that carbonæmia is threatened without such complications as I have hinted at, artificial respiration is the main resource, and cannot be carried out on a better plan than that recommended by Dr. Silvester, although in some cases it may be necessary to supplement it either by the careful introduction of a flexible catheter into the trachea, as recommended by Mr. Hutchinson, or by tracheotomy.

In the more chronic forms of death by carbonæmia—and under this head is included the great majority of deaths—the phenomena produced by venous blood gradually polluting the arterial stream, such as vertigo, delirium, general congestion, &c., combined with those voluntary muscular efforts on the part of the sufferer to make the respiration more effective, and so satisfy that urgent want—the want of breath—point to the expediency of placing the patient, if he has not already found it for himself, in the best position for avoiding any encroachment of the abdominal viscera upon the space allotted to the lungs; of admitting pure air of a genial temperature, say 60 to 70 deg.; of keeping the surface of the body warm; of applying sinapisms or turpentine stupes to the chest, with the double view of determining to the surface, and thereby taking off some of the pressure on the distended right heart, as well as stimulating the whole organ to increased action; of, perhaps, resorting to the local abstraction of blood by opening a vein in the arm or neck; of refraining from the injudicious, and checking the sometimes excessive, administration of alcohol, which impedes the oxidation of the nervous and other tissues; and of giving ammonia in some form, from the benefit accruing from its action on the skin.

In considering the means of obviating the tendency to death by coma, we are naturally led to inquire on what the coma depends, and, unfortunately, we too often find it caused by a condition of the nervous system that is not greatly amenable to treatment; for, if it arise from apoplexy, or hydrocephalus, or acute or chronic diseases of the brain, its very development, under the circumstances, indicates such an advanced stage of the disorder, as to preclude much hope of the patient's recovery. Still, there are cases in which coma is not necessarily fatal. I allude to those of epilepsy, uræmia, certain cases of fever, poisoning by opium, &c. In all these the tendency to death arises from an altered condition of the medulla oblongata; but while, in the first series, it seems to depend on organic change in the nervous structure, in the second it is owing to what is termed, in our present imperfect knowledge, functional derangement.

Where there is reason to believe that the suspension of the cerebral function depends on a poison, the appropriate treatment must be adopted. In two cases of epilepsy, where the coma has been so profound, and the lividity of the surface so persistent that death from carbonæmia seemed imminent, I have taken blood largely from the arm with the best result. The following case also shows that the tendency to death by coma, in some cases of epilepsy, is best combated by the use of those means that relieve a loaded or congested state of the vascular system.

In 1850, I was called to A. B., aged 60. He was a short florid man. For three years he had been subject to epileptic fits, the coma sometimes lasting several hours. I found him in a state of apparent deep intoxication, but he rallied after being cupped at the back of the neck, yet still complained of pain and weight in the head. After free purgation, he was as well as usual. Some months afterwards he fell down stairs, and his friends thought he was dead. I found him with a large scalp wound on the right side of the head, and with a divided branch of the temporal artery, from which blood was issuing freely, and which was not easily arrested; but the hæmorrhage had a salutary effect, and he gradually emerged from the coma. When conscious, he stated that, some hours before the seizure, he had pain and heaviness in the head; this was followed by vertigo, and from that time he ceased to remember anything. He was now persuaded to live almost entirely on fish and vegetables, and with this diet, conjoined with strict attention to the bowels, he enjoyed good health, and was free from a fit for many months, indeed as long as he remained under my observation.

But I must bring these remarks to a close, for time will not permit me to allude to Sir B. Brodie's experiments of averting the tendency to death by maintaining artificial respiration in animals until certain states of coma, produced by poison, had passed away; or to Dr. Sibson's admirable paper on the causes which excite and influence respiration in health and disease, or to many other points of interest connected with the subject. But, gentlemen, I cannot conclude these imperfect remarks without taking the liberty of inquiring if some practical conclusions, admitting of application to ourselves, may not be drawn from them.

I presume we all desire to die that death in which the animal life is extinguished before the organic life—the death of old age. Seeing, then, that the great majority of deaths begin at the lungs, should we not take all the care in our power of those treasures in our chest? Do we act wisely in neglecting, especially in the winter months, an ordinary cold or catarrh that may run on to bronchitis, leave us a legacy of chronic winter cough, and ultimately allow the enemy to triumph by *carbonæmia?* Should we exhaust our nervous energy by overwork of mind and fatigue of body, so that the golden bowl may be broken, as in apoplexy, or the silver cord be loosed, as in degeneration and ultimate paralysis of the cerebro-spinal nerve-centres, and the fire of life be extinguished through *coma?* Or should we live, regardless of hygienic and dietetic rules, so that the pitcher may be broken at the fountain, as when cardiac disorganisation and paralysed right cavities of the heart bring defeat to us in death by *asthenia;* or so that the wheel may be broken at the cistern, as when in ruptured aneurism of the aorta we fall by *anæmia?*

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